PROLINE-CE

WORKPACKAGE T4, ACTIVITY T4.1

CREATING SYNERGIES FOR INTEGRATED LAND USE AND FLOOD/DROUGHT MANAGEMENT

D.T4.1.1 COMPILATION OF DELINEATED OBJECTIVES FOR SUSTAINABLE FUNCTION-ORIENTED LAND USE MANAGEMENT

WP T4 – ADVANCEMENT: STRATEGIC POSITIONING AND COMMITMENT

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1. Introduction

The so-called **"DriFLU (Drinking water/Floods/Land use)-Charta"** builds one of the most important outcomes of PROLINE-CE as it will represent a common commitment of the whole project consortium towards an optimized and effective land use and flood/drought management with efficient organizational structures regarding drinking water protection. On the other hand DriFLU-Charta will also gain importance towards a political agreement as this joint declaration act will be signed by notable representatives of each participating country during the Final Conference.

Within the previous working steps of Work Package (WP) T1, T2 and T3 valuable targets towards an effective and efficient drinking water protection through function-oriented land use management practices were identified, committed and even partially evaluated respectively discussed within the pilot actions of WP T2. Thus **national** specific issues and problems are taken into consideration and demand for tailored **Action Plans** in accordance with the DriFLU Charta.

DriFLU Charta will provide also important inputs for different EU guidelines and strategies (EUSDR, EUSALP, EU 2020 Strategy, 2030 Agenda for Sustainable Development, EU Water Framework Directive & RBMP, EU Floods Directive, EU Strategy on Adaptation to Climate Change) and unify purposes and intentions for Central Europe Programme area. Additionally to the PROLINE-CE outcomes also international studies are taken into account (as already mentioned in D.T4.1.2 Draft DriFLU Input Report).

2. Transnational objectives

The following overview about transnational objectives for sustainable function-oriented land use management (subdivided into the different land use categories respectively land cover and "general" issues) with the aim of drinking water protection is built on the main outcomes of previous working steps within WPT1, T2 and T3 supplemented by major statements of further documents [United Nations World Water Development Report (WWAP); Natural Water Retention Measures (NWRM)-project; Sustainable Drainage Systems (SuDS)-Manual] (see D.T4.1.2 in detail).

2.1. Forestry

Clear Cut application	
Avoidance of clear-cut applications (except sanitary cuts)	**KTM 13, 17**
Application of continuous cover forest systems	
Forest ecologically unbalanced (high) wild ungulate densities	
Balancing the wild ungulate densities to a forest ecologically sustainable level	**KTM 13, 17,22**
Increased hunting activities with the purpose of forest ecology	
Resettlement of wild predators like wolves, lynx, etc.	
Harvesting with heavy machinery	
Avoidance of the tractor-skidder method	**KTM 13, 17, 22, 23**
Application of alternatives, Implementation of a resource-friendly exploitation system	
Limitation of Forest Roads within Drinking Water Protection Zones (DWPZ)	
Cutting of huge, old and stable tree individuals	
Foster old, huge and vital tree individuals	**KTM 13, 23, 24**
Forest fire	
Improved management, including preventive measures	**KTM 17**
Fire fighting	
Coniferous monocultures	
Fostering a conversion to mixed forests (according to the Natural Forest Community)	**KTM 13, 23**
Removal of deadwood	
Fostering an adequate deadwood management	**KTM 6**
Spreading of invasive species	
Promotion of plantation of native species	**KTM 18**
Agro-forestry scheme (Agricultural activity in the forest)	
Control on agricultural activities to keep extensive usage	**KTM 2, 3**

2.2. Agriculture

Use of fertilizers (especially nitrate consumption)	
Evaluation and amendment of the Nitrate Action Plan every 4 years	**KTM 2, 12**
Optimisation of Nitrate Directive	
Optimization of the application of fertilisers (Amount due to soil samples and redefinition of time ban of fertilizers and manure application)	
Waiver of fertilisers, especially within sensitive areas	
Strengthening of consultancy and research programmes	
Acceleration of organic farming with guidelines for water protection (e.g. financial incentives)	
Effectiveness of Common Agricultural Policy should be improved towards sustainability and water resources protection (Agro-environmental measures)	
Shift of the water intake area to forested catchments (not in all regions appropriate) or Agroforestry /Silvopasture (trees/shrubs in association with agricultural crops, pastures or livestock – extensive usage!)	
Use of pesticides	
Vegetated buffer zones/strips along agricultural fields	
Acceleration of the Agro-Environmental Programme (e.g. ÖPUL)	**KTM 3, 12**
Incentives for organic agriculture (with biological pest control) and education of farmers	
Minimizing and regulation of the application (e.g. application in spring preferred to autumn)	
Prohibition of pesticide application in DWPZ (organic farming in DWPZ)	
Water abstraction for irrigation purposes	
Investments for improving the state of irrigation infrastructures or techniques	
Water pricing policies	**KTM 7, 8, 11**
Water sources differentiation	
Desalinization treatments	
Excessive or uncontrolled irrigation	
Farming practice regulation (irrigation efficiency to achieve optimum yields)	
Agro-environmental scheme	**KTM 8, 11, 12**
Creation of buffer/sink zones or vegetated water courses (wet buffer strips along streams / wet zones) leading to filtered runoff of sediments, nutrients etc.	
Adopting less water demanding crops	
Water pricing policies (managing the water resources accounting for potential reductions, properly accounting for cascading effects)	
Open croplands between main crops	

Permanent soil cover: implementation of catch crops/cover crops/organic mulch	
Crop rotation	**KTM 2, 12, 14, 17**
Conventional soil tillage	
Fostering conservation tillage, no tillage on slopes	
Non-turning techniques	**KTM 2, 12**
Controlled traffic farming (using always the same tracks)	
Harvesting perpendicular to the slope	
Implementation of legal restriction	
Fostering harvesting parallel to the slope	**KTM 2, 12, 17**
Fostering contour / cross slope farming (strips of closely sown crops alternate with strips of row crops)	
Agricultural areas in floodplain	
Land use change	
Organic farming *)	**KTM 2, 3**
Riparian buffer strips	

***) Remarks:**

IFOAM (Organics International, 2018) defined **organic agriculture** as "a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic Agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved."

Ecological Agriculture ensures healthy farming and healthy food, by protecting soil, water and climate, promotes biodiversity, and does not contaminate the environment with chemical inputs or genetic engineering (Tirado, 2009).

Sustainable agriculture integrates three main goals: environmental health, economic profitability, and social and economic equity. It has been defined as "an integrated system of plant and animal production practices having a site-specific application that will last over the long term" (Gold, 2009). The system must enhance environmental quality and the natural resource base upon which the agricultural economy depends. Satisfy human food and fibre needs, to make the most efficient use of non-renewable and on-farm resources and integrate natural biological cycles and controls. Moreover it must sustain the economic viability of farm operations, and enhance the quality of life for farmers and society as a whole (Gold, 2009).

In EU, all allowed pesticides are listed in EU Pesticides Database, which is available online. Because active substances are registered for a limited number of years (10 or 15) this list is constantly changing. Also, not all plant protection products (PPP) are registered in all member states.

Integrated pest management (IPM) is a standard for **sustainable agricultural use** of pesticides defined in Directive 2009/128/EC. All PPP registered in EU are allowed, but the main focus of IPM is to encourage alternative preventive measures, non-chemical control measures, use of as small doses as possible while still effective etc.

Organic agriculture is a stricter standard, defined in Regulation 889/2008 EC. No synthetic substances are allowed here, but substances like azadirachtin, pyrethrins, quassia etc., which are extracted from plants, or spinosad, which is a micro-organism product, but also natural substances like Copper or Sulphur for fungicide use, are allowed.

"organic/ecological/sustainable farming and manure within DWPZ" in terms of PROLINE-CE should consider following main issues:

Organic farming in many cases involves the application of manure as fertilizer.

On grassland or agricultural areas within drinking water protection zones (DWPZ) it should be forbidden to spray liquid manure. Also solid manure spreading should be obviated within DWPZ. Fact is – spreading of liquid and solid manure endangers the related groundwater resources. The risk of liquid and solid manure for groundwater quality is given through bacteria, viruses, mould fungus and parasites which can be found in livestock faeces. These organisms are serious threats for groundwater quality and human health. Due to this situation it should be avoided to carry out these fertilizing practices within DWPZ.

Any alternative organic fertilizing techniques can be applied instead.

2.3. Urban / Industrial areas / Transport units

Contaminated sites	
Implementation of appropriate measures	**KTM 4**
Remediation of contaminated sites	
Floods (along rivers & torrents)	
Integrative flood risk management (monitoring of the risk management plan, early warning system)	**KTM 6, 7, 23**
Acceleration of natural water retention measures	
Best Practice implementation (avoidance of discharge – and erosion-increasing measures, adaptation of land-use in areas close to rivers/torrents, conservation and improvement of protection forests)	**KTM 12, 13 15**
Strategy for flood events caused by heavy rainfall	
Provision and protection of flooding and retention areas (definition of what is allowed, determined separately for agricultural and urban areas)	
Limitation and prohibition of building area zoning (reconciliation of spatial plans)	

Mandatory consideration of hazard maps within spatial planning (area zoning)	
Preference for non-structural measures	
Improvement of ecological functions of water bodies	
River basin or catchment-oriented planning of measures (interdisciplinary and intrasectoral approach)	
Improvement of survey of flood-induced groundwater pollution (included in RBMPs)	**KTM 14**
Lack of sewage systems in some areas / Insufficient dimensioning of sewage systems	
Investment and construction efforts towards better sewage systems	**KTM 15, 16, 21**
Effective sludge management	
Areas without waste water treatment facilities	
Effluent treatment needs to be increased	**KTM 15, 16, 21**
Construction of additional treatment facilities	
Concrete and artificial surfaces	
More efficient control of waste water discharge	**KTM 21**
Separate system for meteoric waters (infiltration into ground) and waste waters (discharged to waste water treatment plants)	
Increase the amount of green surfaces and blue infrastructure in urban areas	
Increase in population density	
Optimization of urban waste water management systems	**KTM 21**
Increase effluent treatment	
Sewage overflows in case of extreme rainfall events	
Optimization of urban waste water management systems	**KTM 21**
Improvement of urban drainage system and prevent sewer leakage	
Improved recycling of water within urban water cycles (e.g. waste water re-use)	
Intensity of tourism supply	
Optimization of urban waste water management systems	**KTM 21**
Increase effluent treatment	
Sustainable tourism	
The potential effects of Climate Changes are not taken into account in action planning	
Providing incentives (economic or legal) to increase awareness and initiatives about the effect of climate changes	**KTM 24**
Use of prognostic models and scenarios to project climate change effects on population, buildings, water resources, floods and droughts	
Lack of Emergency Municipal Plans for many towns/cities	
Providing incentives through legislation or economic support to draw up the plans	**KTM 14**
High leakage of water supply systems	

Improvement of water supply network	KTM 8, 9
Establishment of reconstruction programme and financing strategy	
Improved catchment management outside urban areas	
Heat pumps (water-water)	
Strict implementation of legislation (water return, wells in compliance with standards)	KTM 21
Banning of heat pump systems without permission	
Inappropriate cultivation of domestic gardens and other green infrastructures within drinking water protection areas	
Awareness raising (professional advice of adequate and effective nutrition, plant protection and the choice of suitable, resistant breeds)	KTM 21
Construction of big buildings or construction areas with underground facilities	
Measures for pollution prevention	KTM 21
Lack of industrial effluents treatments systems / Accidental/catastrophic discharge	
Implementation of appropriate sewage system and devices for wastewater treatment	KTM 15, 21
Optimization of waste management systems and storage	
Industrial waste waters	
Implementation of appropriate measures, such as strict regulation of effluent discharge, monitoring, emergency plans in case of contamination	KTM 1, 21
Better monitoring	
Old industrial locations	
More stringent persecution of contaminated site remediation	KTM 4
Road and parking cleaning and maintenance	
Implementation of appropriate sewage systems and devices	KTM 21
Collection and treatment of road rainwater discharge, particularly within drinking water protection areas	
Road accidental spills	
Effective action plan in case of spills, low reaction time and fast intervention	KTM 21
Road traffic	
Strict implementation of decree on the emission of substances in the discharge of meteoric water from public roads (Slovenia)	KTM 21
Implementation of National environment protection strategy and action plan (Croatia)	
Sealed surfaces	
Implementation of extensive seepage measures with overgrown top-soils	KTM 23, 24
Deployment of green infrastructure (reforestation, urban food gardens, green buildings)	

2.4. Grassland / Pastures

Livestock grazing close to dolines, swallow holes and streams	
Prevent livestock from grazing close to dolines, swallow holes or streams	**KTM 2**
Construction of dams etc. what prevents precipitation water from direct and fast entrance into dolines and swallow holes	
Intensive application of liquid manure to the grassland	
Limitation of the application of liquid manure: prohibition or reduction in quantity and limitation to days when plants can provide a high nitrate uptake rate	**KTM 2**
Ploughing up of grassland	
Implementation of measures for advisory and financial support to avoid conversion of grassland	**KTM 23**
Intensive use of heavy machinery on grasslands	
Extensification of land-use activities on grasslands	**KTM 23**
Intensive grazing activities	
Implementation of adapted grazing strategies	**KTM 23**
Intensive manuring of grasslands	
Manure management – controls and supervisions, prohibitions of manuring in DWPZ	**KTM 2**
Continuous conversion of (permanent) grasslands	
Preservation of existing (permanent) grasslands	**KTM 2, 23**
Pollution of watercourses	
Supporting guidance for creation of low-input grassland to convert arable land at risk of erosion or flooding (Riparian grass buffers)	**KTM 2, 17, 23**
Increase of livestock density, inappropriate livestock waste and manure management	
Optimisation of Nitrate Directive	**KTM 2, 12, 17**
Reduced stocking density	
Support for investments in storage of manure and training of farmers	

2.5. Wetland

Pollution of watercourses	
Wetland restoration and creation (re-establishment of the hydrology, plants and soils of former or degraded wetlands, installation of a new wetland)	**KTM 2, 6, 7, 13, 17, 23, 25**
Flood risk, erosion	
Preservation and revitalization of wetlands on floodplains	**KTM 2, 6, 7, 13, 17, 23, 24, 25**

2.6. General

Public engagement in development of action plans	
Implementation of site-specific solutions in close cooperation with land owners	
Pressure on water resources quantity	
Climate change adaptation / mitigation and resilience (e.g. water re-use, improvements in legal regulations, reduction of losses from water supply network, retention and acculation zones) also considering main impacts in river basin planning	**KTM 24**
Community use of inner and outer zone of groundwater protection area	
Community use of partitioned groundwater in inner and outer protection zones does not necessarily endanger the water quality, but adequate waste collection, mobile toilets etc. are necessary respectively restrictions (e.g. inner zone fenced)	**KTM 13, 19**
Design of infrastructure under steady-state weather conditions	
Adaptation of building standards for design, maintenance and operation of infrastructures (due to CC: e.g. adapted urban drainage systems, integration in building regulations)	**KTM 24**
Pressure on water resources management	
Integrated Water Management for implementing efficient voluntary agreements to prevent conflicts among the users during droughts	**KTM 24**
Soil degradation and consumption	
Evaluating effects of Soil Protection Plans on water bodies	**KTM 13, 14, 21**
Flood impact	
Assessing flood impacts on drinking water supply systems and on water bodies (at river basin scale)	**KTM 14**
Qualitative/Quantitative unbalance of law/plans/measures implementation	
Identification of priorities and measurable effects of responses to environmental drivers and pressures on water quality/quantity	**KTM 14**
Analysis of links between employment/education policies and the water sector	
Social, employment and education policies in water resources sector	
Legalization of illegal construction on flood areas	
To prevent legalization of construction on flood areas	
Surface water intrusion in the well	
Sealed well heads in flood prone zones to prevent surface water intrusion in the well during the flood event	**KTM 13**
Pollution sources in flood prone areas are not known / identified	
Register of potential point pollution sources for efficient incident management in case of flood	**KTM 14**

event	
Individualistic (Non-Sectoral) approach to common problematics regarding protection of drinking water resources	
Joined and integrated management of drinking water resources (horizontal and vertical co-operation)	**KTM 13**
Lack and not effective control over implementation of DWPZ restrictions	
Strict implementation and inspection of DWPZ restrictions	**KTM 13**
Seawater intrusions in coastal areas	
Prevention of saltwater intrusions (e.g. monitoring systems, early warning systems for water suppliers, barrier wells, deep recharge wells, maintenance of coastal wetlands)	**KTM 25**
Lack of information regarding groundwater salinity while designing and operating unconfined coastal aquifers	
Assessment of salinization of groundwater and surface waters considering impacts of CC	**KTM 14, 24, 25**

Derived from D.T.2.3.4 (Strategic identification of needs for action for clusters) respectively D.T.2.3.1 (Evaluation reports for each pilot action) to each of the most important GAPs/BMPs (Best Management Practices) the related "Adaptation of policies" will be selected and supplemented or adapted accordingly to point out possible implementation processes.

Concerning possible funding systems for the most important Best Management Practices inputs will be taken from D.T3.1.2 (Catalogue of measures and of possibilities for funding ecosystem services).

3. National objectives

The objectives on national level towards drinking water protection are derived from the country-specific reports within WP T1 (D.T1.1.1. + D.T1.2.1) containing the SWOT-Analysis and the DPSIR (driving forces, pressures, state, impacts and responses)-approach as well as best management practices regarding different types of land use/vegetation cover and their respective evaluation.

Derived from the DPSIR-table of D.T1.1.1 the "Driving forces" and the relevant "Responses" were selected by each partner country, supplemented by the KTM (Key type measure)-numbers. Afterwards the most important and relevant Best Management Practices (BMP), focused on up to 5 BMPs per land use/vegetation cover category has to be chosen. The general objectives/recommendations are derived from the SWOT-Analysis of D.T1.1.1 (focused on the "Opportunities"). Following tables show the results of each partner country:

3.1. Austria

FORESTS	
Driving forces	**Responses**
Clear Cut application	KTM 13 + 17: Avoidance of clear-cut applications, application of continuous cover forest systems
Forest ecologically unbalanced (high) wild ungulate densities	KTM 13 + 17 + 22: Balancing the wild ungulate densities to a forest ecologically sustainable level; increased hunting activities with the purpose of forest ecology; resettlement of wild predators like wolves, lynx, etc.
Extended application of the tractor skidder method in the course of timber yield	KTM 13 + 17 + 22: Avoidance of the tractor-skidder method; application of alternatives like skyline-cranes
Coniferous monocultures	KTM 13 + 23: Creation of mixed forest stands according to the natural forest community; Identification of the spatial distribution of natural forest communities (forest hydrotope types) within the DWPZ; plantation of autochthonous tree species; natural regeneration dynamics
Cutting of huge old and vital tree individuals	KTM 13 + 23 + 24: Fostering of huge old and vital tree individuals; management of the gene-pool of tree species within the DWPZ
GRASSLAND / PASTURES	
Driving forces	**Responses**
Livestock grazing close to dolines, swallow holes and streams	KTM 2: Prevent livestock from grazing close to dolines, swallow holes or streams; Construction of dams, fences etc. what prevents precipitation water from direct and fast entrance into dolines and swallow holes

Intensive application of liquid manure to the grassland	KTM 2: Limitation of the application of liquid manure: prohibition or reduction in quantity and limitation to days when plants can provide a high nitrate uptake rate.
TOURISM	
Driving forces	**Responses**
Alpine shelter huts without sewage systems	KTM 1 + 21: Equipping alpine shelter huts with sewage systems; adequate technical solution adapted to the site-specific situation of each hut.
Ski station with artificial snow-making (ASM) in DWPZ	KTM 1 + 13 + 21: Adaptation of ASM to the general water availability of the region; No construction of reservoir lakes in areas which are sensitive in terms of nature conservation; strict maintenance guidelines for snow groomers and other technical devices; Sewage systems for restaurants and huts; Abandonment of ski stations or parts of ski stations situated within an important DWPZ, if possible
STONE QUARRIES / GRAVEL PITS	
Driving forces	**Responses**
Active stone quarries / gravel pits situated within DWPZ	KTM 13 + 17: Abandonment respectively avoidance of active stone quarries /gravel pits within DWPZ; rock-faces have to be kept in original slope for preventing the extension of the stone quarry area through the abandonment process
AGRICULTURE	
Driving forces	**Responses**
Use of fertilisers (especially nitrate consumption)	KTM 2: Evaluation and amendment of the Nitrate Action Plan every 4 years; Acceleration and evaluation of the effectiveness of the Austrian Agro-Environmental Programme (ÖPUL); Optimization of the application of fertilisers (according to time and amount due to soil samples); Waiver of fertilisers, especially within sensitive areas. KTM 12: Strengthening of consultancy and research programmes; Acceleration of organic farming (5. Organic Action Programme, 2015); Effectiveness of Common Agricultural Policy should be improved towards sustainability: Shift of the water intake area to forested catchments (if possible)
Use of pesticides	KTM 3: Reduction of areas at risk;

	Continuous monitoring; Restricted licensing; Minimizing and regulation of the application (e.g. application in spring preferred to autumn); Prohibition of pesticide application in DWPZ; Organic farming in DWPZ KTM 12: Funding and consultancy and awareness raising;
Floods within agriculturally used retention areas	KTM 13: Erosion protection; buffer zones KTM 12: Acceleration of the Austrian Agro-Environmental Programme (ÖPUL)
URBAN AREAS	
Driving forces	**Responses**
Contaminated sites (“Altlasten”)	KTM 4: Implementation of appropriate measures; Remediation of contaminated sites
Floods (along rivers & torrents)	KTM 6 + 7 + 23: Integrative flood risk management (monitoring of the risk management plan); Acceleration of natural water retention measures; KTM 12 + 13 + 15: Best Practice implementation (avoidance of discharge – and erosion-increasing measures, adaptation of land-use in areas close to rivers/torrents, conservation and improvement of protection forests); Strategy for flood events caused by heavy rainfall; Provision and protection of flooding and retention areas; Limitation and prohibition of building area zoning; Mandatory consideration of hazard maps within spatial planning (area zoning); Preference for non-structural measures; Improvement of ecological functions of water bodies; river basin or catchment-oriented planning of measures

General objectives:

- To guarantee a sustainable water supply, especially in dry areas, also in the future, adequate water management plans respectively water efficiency programmes are crucial
- Vulnerability and risk assessment mapping according to state-of-the-art methods should be intensified in karstic areas
- Additional quality parameters and other substances should be added to the threshold list and considered for amendments of laws
- Improvement of the monitoring system due to densification of the testing network

- Stricter laws in general including actual programmes and measures should be developed according to the demands of sustainable water quality and quantity
- River basin or catchment-oriented planning of measures
- Use of EU funds (Rural Development Programme) for the compensation of additional expenses due to adjusted forest management measures for drinking water protection
- Better communication and dissemination of knowledge and experience between decision-makers / legislators and experts
- Integrative flood risk management
- Stricter rules concerning fertilizer and pesticide applications and respective awareness raising
- Strategic and Integral Source Water Protection Concepts and Planning for DWPZ
- Consideration of the Guideline “protection of groundwater within gravel pits”, developed by the ÖWAV (Austrian Water and Wastewater Association), within DWPZ and development of regional programmes for the designation of suitable areas for material extraction(like in Upper Austria) where it is necessary

3.2. Slovenia

IMPACT OF LAND USE ACTIVITIES ON WATER RESOURCES QUALITY AND QUANTITY	
URBAN AREAS	
Driving forces	**Responses (MEASURES)**
Areas without sewage system	KTM 1 Implementation of appropriate measures: construction of the sewage system
Damaged sewers	KTM 1 Inspection and remediation of the sewer system
Sealed surfaces	KTM 21 Separate system for meteoric waters (infiltrating into ground) and waste waters (discharged to WWTP)
Heat pumps (water-water)	KTM 21 Strict implementation of legislation (water return, wells in compliance with standards) Banning of heat pump system without permission
Cemeteries	KTM 21 Optimized use of fertilizers (fertilization plans)
Construction of big buildings or construction areas with	KTM 21

facilities underground	Measures for pollution prevention
AGRICULTURE	
Driving forces	**Responses**
Use of fertilisers	KTM 2 - optimized use of fertilizers (fertilization plans) - ecological agriculture
Manuring	KTM 2 - optimized use of manure (manuring plans) - ecological agriculture - appropriate storage facilities for manure
Agricultural activities	KTM 12 Implementation of Agricultural Advisory Service
TRANSPORT UNITS	
Driving forces	**Responses**
Road traffic	KTM 21 Strict implementation of Decree on the emission of substances in the discharge of meteoric water from public roads (OG RS 47/2005)
Railway	KTM 2 and 21 Optimized use of fertilisers
Road accidental spills	KTM 21 Effective action plan in case of spills, low reaction time and fast intervention
INDUSTRIAL UNITS	
Driving forces	**Responses**
Industrial waste waters	KTM 1 and 21 - Strict implementation of legislation regarding water monitoring for determining impact of the activity or operation of the plant - better inspections
Old burdens (contaminated soil)	KTM 4 Remediation of these contaminated sites
FOREST	
Driving forces	**Responses**
sleet (deadwood)	KTM 22 fostering an adequate deadwood management after sleet events
Diminishing run-off	KTM 17 + 23

	Protective forests
IMPACT OF FLOODS	
Driving forces	**Response**
River training for the purpose of floood safety	KTM 23 Watercourse maintenance with consideration on river to groundwater communication
Maintenance of hydraulic structures and river canals	APM 28 Maintainance of hydraulic structures and river sections according to defined maintenance practice
Pollution sources on flood areas	KTM 21 Identification of the flood induced pollution potential (sources) from the flood areas. Local measures for their protection, transfer of sites out of the flood prone zones.
Urban drainage flooding – sewerage (incl. Combined Sewer Overflows).	KTM 21 Development of Sustainable Urban Drainage (SUDS).
Abandoned groundwater wells and boreholes	KTM 4 Adequate decomposition of strucutures after their usage (old wells, boreholes..) and of flood protection structures

General objectives:

- eco farming with eco products with higher prices: as the Slovenia pilot area lies in the outskirts of capital city Ljubljana, eco farming could have a great potential.
- use of ecosystem services: Humans are not only part of ecosystems, but we also benefit from ecosystems. These benefits (direct or indirect) known as ecosystem services are key factors that affect our wellbeing. Different land uses provide and enables various ES. Protection and usage of land and water resources should use ES as indicators what effects human wellbeing and what the ecosystems can provide us.
- combined approach addressing droughts and floods with multiuse reservoirs: there are many existing multiuse reservoirs in Slovenia, which are not an active part of the water management process, respectively their full potential is not exploited. They could get into function of balancing demands and activities – water supply, flood control, soil erosion, irrigation etc.

3.3. Hungary

URBAN AREAS	
Driving forces	**Responses**
Areas without sewage system	KTM 1 Construction of the sewage system and devices for wastewater treatment
Sealed artificial surfaces and pollution deposition from air	KTM 21 Increase the amount of green surfaces
Areas without waste water treatment plants	KTM 1 Set up of waste water treatment plan for sewage system; Set up of individual treatment plants for individual houses
Climate change	KTM 24 Integrated urban planning; Urban flood risk management; KTM 23 Natural water retention measures
Centralized rainwater infiltration	KTM 21 Implementation of decentralized rainwater infiltration Implementation of decentralized infiltration measures
River regulation in urban areas	KTM 6 Rehabilitation, restoration of natural conditions or usage of environmental friendly solution in river regulation
AGRICULTURE	
Driving forces	**Responses**
Use of fertilisers (N consumption) and pesticides	KTM 2 Precision agriculture and/or ecological agriculture KTM 3 Precision agriculture; Control of pesticide usage; Prohibition of pesticide application in DWPAs
Innappropriate collection or use of manure	KTM 12 Training of farmers KTM 2 Investments into manure storage
Climate change	KTM 7 Drought mitigation measures
Agricultural areas in floodplain	KTM 2, KTM 3 Land use change Organic farming

	Riparian buffer strips
Drainage of agricultural areas (especially excess water inundated areas)	KTM 23 Greening of frequently inundated areas (land use change to grassland, wetland, agro-forestry) Natural water retention measure
INDUSTRIAL AREAS	
Driving forces	**Responses**
Industrial waste waters	KTM 15 Implementation of appropriate measures, better monitoring
Accidental pollution from industry	KTM 4 Remediation of contaminated sites
TRANSPORT UNITS	
Driving forces	**Responses**
Road accidental spills	KTM 21 Effective action plan in case of spills,fast reaction time and fast intervention
FORESTS	
Driving forces	**Responses**
Clear cutting	KTM 13 Continuous forest cover
PASTURES	
Driving forces	**Responses**
Intensive grazing	KTM 2 Control of grazing Prohibition in DWPAs
Intensive manuring of grasslands	KTM 2 Control on manure management Prohibition in DWPAs

General objectives:

- Use of and research on ecosystem services
- Combined approach addressing droughts and floods with multiuse reservoirs
- Use of EU funds, particularly agricultural, structural and cohesion funds for co-financing projects to manage groundwater and surface water resources
- Upgrading of the requirements of water management in urban planning
- Increase the number of co-operations between stakeholders
- Intensification of the cooperation between farmers and water suppliers to enhance the drinking water protection in and beyond the borders of DWPA
- Ensuring minimum ecological flow in drought-endangered river basins

- Fostering awareness of humans to flood risks to increase the individual protection of humans and belongings
- Synchronized water protection and flood risk management measures
- Realization of "greening" scheme to enhance water protection
- Promotion of precision agriculture

3.4. Croatia

IMPACT OF LAND USE ACTIVITIES ON WATER RESOURCES QUALITY AND QUANTITY	
URBAN AREAS	
Driving forces	**Responses**
Lack of sewage systems in some areas	KTM 16: Investment and (re)construction efforts towards better sewage systems must continue
Areas without waste water treatment facilities	KTM 16: Increase of effluent treatment; Construction of additional treatment facilities
Concrete and artificial surfaces	KTM 21: Construction of separate systems for meteoric water and sewage water; Increase of the amount of green surfaces (infiltration zone)
AGRICULTURE	
Driving forces	**Responses**
Use of fertilizers (mostly N-based)	KTM 2: Organic and ecological farming
Innappropriate use of manure	KTM 21: Training of farmers; Investments into manure storage
Use of pesticides	KTM 3: Measures from Croatian "National Action Plan To Achieve Sustainable Use of Pesticides for the period 2013-2023"
Water abstraction for irrigation and livestock farming	KTM 8, 12, 15, 24, 25: Investments for improving the state of irrigation

	infrastructures or irrigation techniques; Improved water pricing policies; Additional water sources (e.g. rainwater harvesting, using uncaptured springs)
FORESTS	
Driving forces	**Responses**
Clear cutting and deforestation	KTM 17, 23: Implementation of a resource-friendly exploitation system; Prohibition of clear cut in sensitive or protected areas; Enforcement of stricter inspections and penalty of illegal clear cuts
Forest fires	KTM 17, 22, 23: Improved preventive measures; Improved forest and risk management
TRANSPORT UNITS	
Driving forces	**Responses**
Accidental road spills	Effective action plan in case of spills (especially in DWPZ); Fast intervention and reaction of responsible services
Road traffic	KTM 21: Construction of separate collectors for hazardous substances (e.g. oil), Implementation of National environment protection strategy and action plan (OG 46/02).
INDUSTRIAL AREAS	
Driving forces	**Responses**
Insufficient dimensioning of sewage systems	KTM 16, 21: Construction of separate systems for meteoric water and industrial wastewaters; Prevention of wastewater discharge without previous treatment (e.g. into rivers)
Industrial waste waters	KTM 15, 21: Further efforts towards improved purification systems; Improvement of monitoring of hazardous substances
Old industrial locations	KTM 4: Site remediation, removal of hazardous substances

IMPACT OF FLOODS/DROUGHTS	
URBAN AREAS	
Driving forces	**Responses**
Insufficient dimensioning of sewer systems	KTM 1, 16: Investment efforts and constructions of additional sewage systems
Urban development in flood prone areas	KTM 23, 6, 7: Investment efforts and constructions of additional sewage systems; Development of improved retention capacity; Prevention of construction in flood prone area
Inefficiency of river banks	KTM 6, 7, 23, 24: Investments into construction of proper banks; Better preparation for flood events; Prevention of gravel/sand theft from river banks
Closed karst field in mountain areas	KTM 6, 7, 23, 24: Proper drainage of karst terrains has to be devised (e.g. hydrotechnical melioration)
AGRICULTURE	
Driving forces	**Responses**
Land use change	KTM 4: Increase of green areas; Construction of protection systems; Prevention of land use change
Conventional soil tillage	KTM 8: Fostering conservation tillage; Non-turning techniques
Insufficient dimensioning of defensive embankments in rural areas	KTM 23, 24: Further investments into flood protection infrastructure
FORESTS	
Driving forces	**Responses**
Deforestation and clear cutting	KTM 22: Implementation of legal restrictions to avoid clear-cuttings beyond the borders of DWPZ
Extreme meteorological events in forests (sleet, strong winds)	KTM 8, 17, 23: Adequate forest practice and active response in the

	case of large scale storm events
Forest fires	KTM 17, 22: Forest restoration (reforestation)
TRANSPORT UNITS	
Driving forces	**Responses**
Development of transport infrastructure	KTM 13, 15, 21: Development of retention capacity
ENERGY PRODUCTION	
Driving forces	**Responses**
Hydropower production	KTM 17, 23: Adequate monitoring of hydrological properties; Downstream erosion control

Besides responses in form of Key Types of Measures, these best management practices also contribute as responses to driving forces seen in table above:

- Sustainable forest management and establishment of protective forests; afforestation
- Rural Development Programme of the Republic of Croatia – further development of agricultural production, technology and quality
- Protection of water from pollution caused by nitrates originating from agriculture
- Sustainable use of pesticides
- Encouraging organic farming
- Maintenance of water, soil and air quality in agriculture
- "Investment Program for the preparation, design, reconstruction, rehabilitation and construction of drainage facilities in the area of Split-Dalmatia County and allocation of funds of the County Budget to cities and municipalities for these purposes in 2017", relevant for PA Imotsko polje
- Defining and establishing sanitary protection zones
- Reconstruction of public water supply network
- Establishment of groundwater monitoring network (quality, water levels, etc.)
- Reconstruction and regulation of flood defence infrastructure
- Flood hazard and flood risk maps (as a non-structural defence measure)
- Operational flood control
- Wetland restoration
- Prevention of land-use change
- Educative brochure and awareness raising activities

- Encourage and promote innovative solutions of sustainable waste management
- Natural wastewater treatment system (e.g. artificial wetlands)

General objectives:

- Due to Croatia's recent admittance in the EU, substantial amount of funds is available for investments in public water supply network, sewage systems, waste water treatment facilities and flood mitigation (about 4.4 billion Euros). This will reduce losses in water supply network, improve water quality and quantity and result in better sewage coverage nation-wide.
- During the period 2010-2015 an increase of 376% in organic farming has been reported. Therefore, efforts (incentives, financial stimulus, dedicated markets) to increase percentage of organic farming in Croatia must continue.
- Drinking water protection zones are proclaimed for the majority of surface and groundwater abstraction points. Croatia has established programmes which provide both operational and surveillance monitoring. For groundwater monitoring, only quantitative and chemical surveillance monitoring programmes exist, while chemical operational monitoring is not carried out yet. In the Pannonian area (main agricultural area) groundwater quality monitoring will be aligned with the need to monitor the status of water in relation to nitrate pollution from agriculture.
- Croatia has high potential for application of nature based solutions and non-structural measures for flood mitigation. This includes measures such as: prevention of land use change, conservation tillage, green infiltration zones in cities, buffer strips along watercourses, retention ponds on farms, river restoration, upland wetland and floodplain restoration/conservation.
- Stricter inspections concerning use and proper application of pesticides and fertilizers are necessary. This problem is enhanced by cross-border sale of plant protection products, where they can be bought without proper license.
- Use of ecosystem services (ESS) is a relatively new and developing concept in Croatia. Ecosystems (forest, wetland, grassland, etc.) in their optimal shape provide services (regulating, provisioning, supporting and cultural) which are beneficial from standpoint of water protection and general environmental well-being.

3.5. Italy

IMPACT ON WATER RESOURCES QUALITY AND QUANTITY	
URBAN AREAS	
Driving forces	Responses

Expansion of artificial and concrete surfaces	KTM 6 + 7 + 17 + 23: Creation of green and blue infrastructures in urban areas (i.e. green roofs, parks, urban ponds and wetlands)
Increase in population density	KTM 21: Optimization of urban waste water management systems Increase effluent treatment capacity
Areas without sewage systems	KTM 21 - 15: Implementation of appropriate sewage system and devices for wastewater treatment
Sewage overflows in case of extreme rainfall events	KTM 21: Optimization of urban waste water management systems Improvement of urban drainage system
Non-compliant urban and domestic wastewaters treatment plants	KTM 21: Improve treatment plants
The potential effects of Climate Changes are not taken into account in action planning	KTM 24: Providing incentives (economic or legal) to increase awareness and initiatives about the effect of climate changes Studies on effects of extreme rainfall events in sewage flows and efficiency of sewage systems
Intensity of tourism supply	KTM 21: Optimization of urban waste water management systems Increase effluent treatment capacity Sustainable tourism
AGRICULTURE (CULTIVATION AND LIVESTOCK FARMING)	
Driving forces	**Responses**
Use of mineral fertilisers (mainly N consumption)	KTM 2: Optimisation of Nitrate Directive Farming practice regulation Agri-environmental measures [BP MA2 Reducing runoff of phytosanitary products and fertilizers, BP SR7 Creation of buffer strips]
Use of pesticides	KTM 3: Farming practice regulation Agri-environmental measures Support for integrated farming Promote organic farming [BP MA1 Optimized application of phytosanitary products]
Water abstraction for irrigation purposes	KTM 7 + (8) + (11): Investments for improving the state of irrigation infrastructures and/or irrigation techniques Water pricing policies Water sources differentiation (Carrying out a better alternation of water sources in order to reduce the probability of depletion)
Excessive or uncontrolled irrigation	KTM 12 + (8) + (11): Metering of consumptions and water pricing policies Farming practice regulation Agri-environmental scheme Improving irrigation techniques

Inappropriate livestock waste and manure management	KTM 2 + 12: Optimisation of Nitrate Directive Support for investments in storage of manure, training of farmers, enforcing manure spreading calendars [BP MA3 Soil management, SR7 Creation of buffer strips]
Increase of livestock density	KTM 2 + 12: Optimisation of Nitrate Directive Support for investments in storage of manure, training of farmers
INDUSTRIAL AREAS	
Driving forces	**Responses**
Lack of industrial effluents treatment systems Accidental/catastrophic discharge	KTM 15 + 21: Implementation of appropriate sewage system and devices for wastewater treatment Optimization of waste management systems and storage [BP SR3 Guidelines for integrated requalification of natural watercourses]
TRANSPORT UNITS	
Driving forces	**Responses**
Road and parking cleaning and maintenance	KTM 21: Implementation of appropriate sewage system and devices
FORESTS	
Driving forces	**Responses**
Incorrect management (e.g. unregulated cut)	KTM 17: Improved management Zoning of land to preserve habitat Increased conservation areas [BP MF1 Well scheduled cutting turns; BP MF2 optimal dimensioning of cutting areas, BP MF8 BP MF9 optimization and managing residues of cutting operations]
Fires	KTM 17: Improved management Fire fighting [BP MF3 Intermediate cuttings; BP MF4 Selection of species for utilization; BP MF7 Cleaning and mowing of shrub and grass in the forest; BP MF9 Managing residues of cutting operations; BP MF10 Managing new-establishing forests]
IMPACT ON FLOODS/DROUGHTS	
URBAN AREAS	
Driving forces	**Responses**
Expansion of artificial and concrete surfaces	KTM 6 + 7 + 17 + 23: Creation of green and blue infrastructures in urban areas (i.e. green roofs, parks, urban ponds and wetlands)
Lack of Emergency Municipal Plans for many towns in Central and Southern Italy	KTM 14: Providing incentives through legislation or economic support to draw up the plans
AGRICULTURE (CULTIVATION AND LIVESTOCK FARMING)	

Driving forces	Responses
Land use change	KTM 6: Construction of the dike system and protection system [BP MA5 Maintenance of terraced agricultural areas] Construction of modern water supply system to cope with increased impervious surfaces
Cultivation intensity	KTM 6: Implementation of new irrigation methods (artificial irrigation instead of gravity irrigation) Sustainable soil working (ploughing) to maintain hydraulic properties ([BP MA3 Soil management]
Climate Change	Farming practice regulation Creation of buffer/sink zone for nutrients and reducing runoff promoting recycling/reuse of effluents (industrial/civil) [BP SR1 Integrated hydraulic-environmental restoration of water streams within the piedmont belt; BP SR7 Creation of buffer strips and wetland basins; BP SR8 Wooded Buffer Strips in rural areas; BP SR5 Implementation of the Technical regulations for the maintenance of natural and artificial water courses in the RN2000 sites]
INDUSTRIAL AREAS	
Driving forces	**Responses**
Expansion of industrial areas	KTM 6 + 7: Construction of storm waters basins and/or pumping stations which will operate during flood events
Water consumption	KTM 13: Differentiation of water supply sources (i.e. freshwater/groundwater) promoting recycling/reuse of effluents (industrial/civil)
FORESTS	
Driving forces	**Responses**
Incorrect forest management (e.g. unregulated cut, no wood harvest)	KTM 17: Improved forest management [BP MF1 Well scheduled cutting turns; BP MF2 optimal dimensioning of cutting areas, BP MF8 BP MF9 optimization and managing residues of cutting operations]
Fires	KTM 17: Improved forest management Fire fighting [BP MF3 Intermediate cuttings; BP MF4 Selection of species for utilization; BP MF7 Cleaning and mowing of shrub and grass in the forest; BP MF9 Managing residues of cutting operations; BP MF10 Managing new-establishing forests]
ANTHROPOGENIC (e.g. industrial, urban, agriculture) and NATURAL (e.g. forests)	
Driving forces	**Responses**

Climate Change	KTM 24: Limit CO_2 emission by national strategy and international volunteer agreement (COP 21) Providing incentives (economic or legal) to increase awareness about the impacts of climate change and initiatives about the adaptation strategies) Increase energy efficiency of water supply systems and decrease water uses and abstractions

General objectives:

- Use of EU funds, particularly structural and cohesion funds for co-financing (ground)water projects
- Realization of interdisciplinary scientific project on valuation of groundwater resources and ecosystem services
- Better communication between scientists-professionals and local actors and improvement of the transfer of results to decision makers and authorities responsible for the implementation of European directives
- Interdisciplinary research topics with significant stakeholders in the region in order to meet the transboundary (ground)water policy and (ground)water management needs
- Development of efficient education system for public water management administration in cooperation with decision-makers, legislators, NGOs and research institutions
- Better communication and dissemination of knowledge and experience between decision-makers and legislators and water scientists and experts working on national or international scientific or professional (ground)water projects
- Implementation of the measures defined in the Water Framework Directive (compliance with environmental objective, monitoring of surface water and groundwater)
- Implementation of good practices for maintenance of biodiversity, landscape, soil protection and water resources (recovery of local varieties with lower water consumption, adaptation measures to climate change, improving irrigation efficiency, ensure compliance with Water Framework Directive)
- Government mission structure against geo-hydrological risk and for development of Hydraulic Infrastructure attempts providing a rationale programming for priorities and investments

3.6. Poland

FORESTS	
Driving forces	**Responses**
Clear Cut application	KTM 13 + 17: Avoidance of clear-cut applications, application of continuous

	cover forest systems
N assimilation from atmosphere	KTM 2 implemenation of measures to increase N consumption, e.g. mixed forests
Removal of deadwood	KTM 6 fostering an adequate deadwood management
Coniferous monocultures	KTM 13 + 23: Creation of mixed forest stands according to the natural forest community; Identification of the spatial distribution of natural forest communities (forest hydrotope types) within the DWPZ; plantation of autochthonous tree species; natural regeneration dynamics
Cutting of huge old and vital tree individuals	KTM 13 + 23 + 24: Fostering of huge old and vital tree individuals; management of the gene-pool of tree species within the DWPZ
GRASSLAND / PASTURES	
Driving forces	**Responses**
Plowing up of grassland	KTM 2, 23 Implementation of measures for advisory and financial support to avoid conversion of grassland
Intensive application of liquid manure to the grassland	KTM 2: Limitation of the application of liquid manure: prohibition or reduction in quantity and limitation to days when plants can provide a high nitrate uptake rate.
AGRICULTURE	
Driving forces	**Responses**
Use of fertilisers (N consumption)	KTM 2: Appropriate measures – i.e. eco-friendly bio-agriculture
Use of pesticides	KTM 3: Reduction of areas at risk; Prohibition of pesticide application in DWPZ; Organic farming in DWPZ KTM 12: Education
Open croplands between main crops	KTM 2, 12, 14, 17 Implementation of catch crops
URBAN AREAS	
Driving forces	**Responses**
Sealed surfaces	KTM 23, 24 Implementation of desealing measures
Insufficient sewage systems	KTM 15, 16, 21 Investment and construction efforts towards better sewage systems

3.7. Germany

FORESTS	
Driving forces	**Responses**
N assimilation from atmosphere	KTM 2 Implemenation of measures to increase N consumption, e.g. mixed forests
Clear cuttings and deforestation	KTM 2, 13, 17 Implementation of legal restrictions to avoid clear-cuttings also beyond the borders of DWPZ
Harvesting with heavy machinery	KTM 2, 13, 17, 22, 23 Implementation of a resource-friendly exploitation system
Removal of deadwood	KTM 6 Fostering an adequate deadwood management
Coniferous monocultures	KTM 2, 13, 23 Fostering a conversion to mixed forests
Missing understorey vegetation	KTM 2 Implementation of adequate measure, e.g. natural regeneration
GRASSLAND / PASTURES	
Driving forces	**Responses**
Use of fertilizers	KTM 2 Implementation of appropriate measures, for example: ecological agriculture
Plowing up of grassland	KTM 2, 23 Implementation of measures for advisory and financial support to avoid conversion of grassland
Intensive use of heavy machinery on grasslands	KTM 2, 23 Extensification of land use activities on grasslands
Intensive grazing activities	KTM 2, 23 Implementation of adapted grazing strategies
AGRICULTURE	
Driving forces	**Responses**
Use of fertilizers (N consumption)	KTM 2, 12 Implementation of appropriate measures, for example: ecological agriculture
open croplands between main crops	KTM 2, 12, 14, 17 Implementation of catch crops
Conventional soil tillage	KTM 2, 12 Fostering conservation tillage, non-turning techniques
Harvesting perpendicular to the slope	KTM 2, 12, 17 Implemantation of legal restrictions fostering harvesting parallel to the slope
URBAN AREAS	
Driving forces	**Responses**
Insufficient dimensioning of sewage systems	KTM 15, 16, 21 Reassessment of sewage systems, fostering implementation of seperated sewers

Damaged private sewers	KTM 4 Fostering legal implementation of public controls and renovation activities
Sealed surfaces	KTM 23, 24 Implementation of desealing measures
Centralized rainwater infiltration	KTM 6, 7 Implementation of decentralized rainwater infiltration, e.g. desealing measures
TRANSPORT UNITS	
Driving forces	**Responses**
Sealed surfaces	KTM 23, 24 Implementation of extensive seepage measures with overgrown topsoils
Demolition of structural facilities	KTM 4 Implementation of adapted demolition and restructuring strategies
INDUSTRIAL AREAS	
Driving forces	**Responses**
Insufficient dimensioning of sewage systems	KTM 15, 16, 21 Reassessment of sewage systems, fostering implementation of seperated sewers
Sealed surfaces	KTM 23, 24 Implementation of desealed measures
Centralized rainwater infiltration	KTM 6, 7 Implementation of decentralized rainwater infiltration, e.g. desealing measures
Old industrial locations	KTM 4 More stringent persecution of contaminated site remediation

General objectives:

- Foster further advisory support for farmers to increase their awareness to drinking water and flood protection
- Increase the cooperation between water suppliers and farmers
- As far as possible, existing DWPZ should be extended considering the protective function of aquifer protective layers
- Attaching conditions of financial support primarily to greening activities
- Further restrictions and more precise limitations on using fertilizers and pesticides in and beyond the borders of DWPZ
- Increase the number and space of set-aside areas in agriculture
- Fostering the conversion of arable land to grassland
- Fostering conversion from forest monocultures to mixed forests
- Increase the amount of decentralized rainwater infiltration and retention (desealing, green roofs)
- Ensuring minimum ecological flow in drought-endangered river basins

- Fostering awareness of humans to flood risks to increase the individual protection of humans and belongings
- Reducing losses from water utilities

To each of these GAPs/BMPs the related "Adaptation, Implementation and Acceptance", mentioned within D.T.2.3.1 (Evaluation reports for each pilot action), will be selected and supplemented or adapted accordingly.

Furthermore the main results and findings of the 2nd stakeholder workshop, especially recommendations made by the participants, will be taken into consideration and supplemented within the relevant issues.

Also important on national level will be the main outcomes of D.T3.1.2 (Catalogue of measures and of possibilities for funding ecosystem services) containing specific recommendations for funding systems and optimized institutional respectively organizational structures to implement the proposed Best Management Practices.

Based on all these issues mentioned above each partner country has to develop a respective "Action Plan".

4. Literature

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5. Annex

25 defined Key Type Measures (KTM) within WFD

Selection regarding drinking water and floods (for PROLINE-CE project):

red-relevant, orange-partly relevant, **black-not relevant**

KTM1. Construction or upgrades of wastewater treatment plants

KTM2. Reduce nutrient pollution from agriculture

KTM3. Reduce pesticides pollution from agriculture

KTM4. Remediation of contaminated sites (historical pollution including sediments, groundwater, soil)

KTM5. Improving longitudinal continuity (e.g. establishing fish passes, demolishing old dams)

KTM6. Improving hydromorphological conditions of water bodies other than longitudinal continuity

KTM7. Improvements in flow regime and/or establishment of ecological flows

KTM8. Water efficiency technical measures for irrigation, industry, energy and households

KTM9. Water pricing policy measures for the implementation of the recovery of cost of water services from households

KTM10. Water pricing policy measures for the implementation of the recovery of cost of water services from industry

KTM11. Water pricing policy measures for the implementation of the recovery of cost of water services from agriculture

KTM12. Advisory services for agriculture

KTM13. Drinking water protection measures (e.g. establishment of safeguard zones, buffer zones etc)

KTM14. Research, improvement of knowledge base reducing uncertainty

KTM15. Measures for the phasing-out of emissions, discharges and losses of priority hazardous substances or for the reduction of emissions, discharges and losses of priority substances

KTM16. Upgrades or improvements of industrial wastewater treatment plants (including farms)

KTM17. Measures to reduce sediment from soil erosion and surface run-off

KTM18. Measures to prevent or control the adverse impacts of invasive alien species and introduced diseases

KTM19. Measures to prevent or control the adverse impacts of recreation including angling

KTM20. Measures to prevent or control the adverse impacts of fishing and other exploitation/removal of animal and plants

KTM21. Measures to prevent or control the input of pollution from urban areas, transport and built infrastructure

KTM22. Measures to prevent or control the input of pollution from forestry

KTM23. Natural water retention measures

KTM24. Adaptation to climate change

KTM25. Measures to counteract acidification

Additional Project Measures (APM)

Additional project measures are related to those recognized measures that reach beyond the KTM measures and contribute to the specific objectives of the PROLINE-CE project. Additional project specific measures (APM) are identified in the field of non-constructive measures. Several identified responses (measures) are related to improved governance and similar non-constructive measures. As the project is addressing interaction between floods and drinking water protection, they are also encompassing some measures, which are related to the implementation of EU Floods Directive (2007/60).

APM1 Improved permitting, control and supervision procedures including regulatory supervision process, approvals, technical standards and their implementation.

Permitting procedures in the field of water management usually address the process related to granting of emissions, abstractions, and construction on potentially flood prone zones. The permitting procedures should follow the advances in technology that enable more efficient, long term status supervision, enabling also close interaction with the modelling process as validation tool.

APM2 Regulatory processes regarding flood risk management – spatial planning procedures, protection and restoration floodplains, integrated with the development of River Basin Management Plans (RBMPs) and water conflict resolution procedures.

Improved regulatory mechanisms could prevent floods-drinking water conflict as a non-constructive measure. The gap between the river basin management plans and municipial spatial planning was identified in different countries with recognized necessity for improvements with special position of spatial planning process as conflict resolution tool.

APM3 Improved financing mechanisms for all water services

While KTM9 to KTM11 are addressing water pricing policy measures for the implementation of the recovery of cost of water services for different water users - abstractions, this concept should be extended to other components of water management. Providing a flood protection service by the cost of zero for the end

consumers challenges the free-rider problem and thus aggregated under provision of the service.

APM4 Landslide and erosion control measures

While the PROLINE-CE project is focused on floods – drinking water interaction, other floods related processes, like landslides and erosion processes, should be addressed and managed as well. With water abstraction locations often in the upper, mountainous parts of the catchments, these measures could be essential for the safety of the water resources and water supply.

APM5 Improved understanding of the impacts of different man-made structures and infrastructure potentially affecting flood flows

Modelling of floods in a built environment is still a challenge, and observed flood events too often differ from the flood modelling results on the same area. Typical examples are bridges and culverts being clogged by debris or deposits, but other man-made structures and infrastructure have related uncertainties as well.